IDEAL INDIAN SCHOOL, DOHA- QATAR
MODEL QUESTION PAPER 2021-2022
FIRST TERMINAL EXAMINATION
PHYSICS

Class: XI

Max. Marks: 40
Duration: 1.5 HRS

General Instructions:

i. *All questions are compulsory. There are 18 questions in total.*
ii. *This question paper has five sections: Section A, Section B, Section C, Section D and Section E.*
iii. *Section A contains five very short answer questions and two assertion reasoning MCQs of 1 mark each, Section B has one case based question of 4 marks, Section C contains five short answer questions of 2 marks each, Section D contains three short answer questions of 3 marks each and Section E contains two long answer questions of 5 marks each.*
iv. *There is no overall choice. However internal choice is provided. You have to attempt only one of the given choices in such questions.*

SECTION A

1. Which is the strongest force in nature? Write any two of its properties. (1)

2. Draw velocity- time graph and acceleration- time graph for a freely falling body. (1)

OR

How many light years are there in one metre ?

3. Which of the following instruments is most accurate and why?
i) Metre scale   (ii) Vernier calliper   (iii) Screw gauge (1)

4. Define instantaneous velocity and write the expression for it (1)

5. Write the dimensional formula for Coefficient of viscosity. (1)

OR

Express 1^0 (degree) and $1'$ (minute arc) as radians.

For question numbers 6, and 7, two statements are given - one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is NOT the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

6. **Assertion (A) :** Force on a body and the velocity, with which it is moving , cannot be added.
   Reason   (R) :   It is because, the dimensions of force and velocity are different.   (1)

7. **Assertion (A) :** The average and instantaneous velocity in uniform motion are always equal.
   Reason (R) :   In uniform motion, velocity remains constant.   (1)

SECTION B

Questions 8 is Case Study based question and is compulsory. Attempt any 4 sub parts from the question. Each question carries 1 mark.   (4)

8. Matter, as we know, consists of elementary charged constituents like electrons and protons. Since the electromagnetic force is so much stronger than the gravitational force, it dominates all phenomena at atomic and molecular scales. Thus it is mainly the electromagnetic force that governs the structure of atoms and molecules, the dynamics of chemical reactions and the mechanical, thermal and other properties of materials. It underlies the macroscopic forces like 'tension', 'friction', 'normal force', 'spring force', etc. Gravity is always attractive, while electromagnetic force can be attractive or repulsive.

Another way of putting it is that mass comes only in one variety (there is no negative mass), but charge comes in two varieties: positive and negative charge. This is what makes all the difference. Matter is mostly electrically neutral (net charge is zero). Thus, electric force is largely zero and gravitational force dominates terrestrial phenomena. Electric force manifests itself in atmosphere where the atoms are ionised and that leads to lightning.

   i.   The ratio of the strength of the strong nuclear force to electromagnetic force is
         a. 10^{-3}
         b. 10^{-4}
         c. 10^{2}
         d. 10^{-2}

   ii   Which of the following is correct about the electromagnetic force?
         a. It obeys inverse square law.
         b. It is central force and conservative in nature.
         c. It is weaker than gravitational force.
         d. both (a) and (b)

iii. Gravitational force between two bodies is 1 N. If the distance between them is made reduced half, the force will be
   a. 2 N
   b. 0.5 N
   c. 0.25 N
   d. 4 N

iv. Force of friction and tension in a string are
   a. Nuclear forces.
   b. Gravitational force.
   c. Weak forces.
   d. Electromagnetic force.

v. The weakest attractive force in nature is
   a. Electromagnetic force.
   b. Gravitational force.
   c. Frictional force.
   d. Strong nuclear force.

SECTION C

9. The percentage error in the measurement of length L and time period T of a simple pendulum is 2 % and 3 % respectively. Calculate the percentage error in the measurement of time period of the simple pendulum. (2)

10. The displacement (in metre) of a particle moving along X-axis is given by $x = 18 + 6t + 9t^2$. Calculate its velocity (i) at t= 0 s and t = 2 s (ii) acceleration. (2)

11. Prove that the maximum absolute error in the difference of two quantities is equal to the sum of the absolute errors in the two individual quantities. (2)

12. Two stones are thrown vertically upwards simultaneously with their initial velocities u_1 and u_2 respectively. Prove that the heights reached by them would be in the ratio of $u_1^2 : u_2^2$ (2)

OR

How will you determine the diameter of a planet by parallax method?

13. Using dimensional analysis, check the correctness of the relation $f = \dfrac{1}{2l} \dfrac{\sqrt{T}}{\sqrt{\mu}}$
where f – frequency, l – length, T– Tension and μ – mass per unit length of the string. (2)
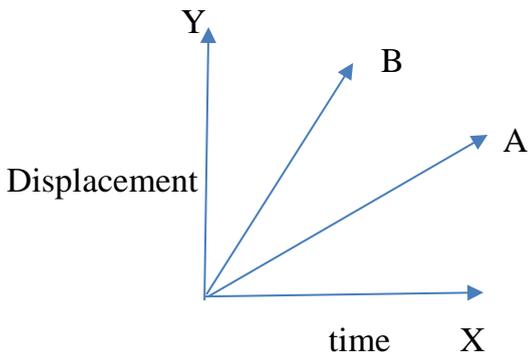
SECTION D

14. The velocity v of a particle is given in terms of time t is $v = at + b / (t + c)$. Determine the dimension of a, b and c. (3)

OR

An electron moving with a velocity of 5×10^4 m/s enters into a uniform electric field and acquires a uniform acceleration of 10^4 m/s^2 in the direction of its initial motion.

(i) Calculate the time in which the electron would acquire a velocity double of its initial velocity.

(ii) How much distance the electron would cover in this time?

15. Consider the motion of an object whose displacement - time graph is given below, such that body A and B makes an angle of 30^0 and 60^0 respectively to the X – axis. (3)

i) Which body has greater velocity and why?

ii) Calculate the ratio of V_A / V_B

16. Convert 6.673×10^{-8} dyne cm^2 g^{-2} into N m^2 kg^{-2} by applying the method of dimension. (3)

SECTION E

17. (i) The volume of the liquid flowing per second through a pipe depends upon the
(a) coefficient of viscosity of the liquid η (b) radius of the pipe r (c) pressure gradient p/l .
Obtain an expression for the volume of the liquid flowing per second dimensionally.
(Take K $=\pi/8$)

(ii) List any two limitations of dimensional analysis. (5)

OR

The length of a rod as measured in an experiment was found to be 2.48 m, 2.46 m, 2.49 m, 2.50 m and 2.47 m respectively . Calculate (i) the mean length (ii) the absolute error in each measurement (iii) the mean absolute error (iv) the relative error (v) the percentage error.

18. (i) Obtain an expression for the distance travelled by a body during nth second of its motion.
(ii) A body travels a distance of 20 m in the 7th second and 24 m in the 9th second. Calculate the distance travelled by the body in the 15th second. (5)

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